

OBSERVATIONS

ON THE

DIFFERENT MODES

OF

PUNCTURING THE BLADDER,

IN CASES OF

RETENTION OF URINE;

POINTING OUT THE ADVANTAGES AND DISADVANTAGES
OF EACH MODE OF OPERATING, UNDER DIFFER-
ENT CIRCUMSTANCES AND DISEASES,

CONTAINING

An ANSWER to the following Question:

“ In cases of retention of urine requiring a puncture of
“ the bladder; what are the advantages, and disadvantages,
“ of the different modes which have been proposed; both
“ as respecting the anatomy of the parts concerned in the
“ operations, and as regarding their more remote conse-
“ quences ?”

TO WHICH IS ADDED,

AN APPENDIX,

CONTAINING SEVERAL

PRACTICAL OBSERVATIONS

On some of the Causes of RETENTION of URINE,

And on the USE of CATHETERS.

By WALTER WELDON, Surgeon.

SOUTHAMPTON :

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TO

THOMPSON FORSTER, Esq.

SURGEON TO GUY'S HOSPITAL.

DEAR SIR,

AS a small testimony of the esteem and friendship, I entertain for you ; I have the honor of inscribing to you my first attempt of adding a mite to the fund of surgical knowledge ;

And, I have the honor to be,

DEAR SIR,

Your most obedient,

And most humble servant,

W. WELDON.



ADVERTISEMENT.

THE observations in the following pages are collected, principally, from notes which the author has taken at different times from cases which presented themselves to him, or came to his knowledge in the course of his studies and practice; and which notes were intended merely for his private use. When they were put into their present form, not a thought was entertained of laying them before the public.

A society, of which the author was a member, instituted in *Southwark*, for the improvement of medicine and surgery, proposed as the subject of their prize dissertations for the year 1791, the question stated in the title page; in answer to which, these observations were thrown together and presented.

Since that time, several of his medical friends requested the perusal of them, and have intimated their wishes that they, as well as some other observations written on a similar occasion, might be put into print.

This,

This, together with a desire of turning the attention of practitioners, in general, more towards the mode of relieving a set of diseases which, the author is sorry to say that he has seen, more than once, prove fatal, from a want of proper attention ; and a desire of removing that prejudice which too generally prevails in the medical world against the operation of puncturing the bladder, has induced him to publish them.

If they shall be found to suggest useful hints to those practitioners, who have not an extensive practice in surgery, but yet are liable, occasionally, to have the management of these diseases, without having an opportunity of calling in a more experienced surgeon to their assistance, the intention of the author will, in great measure, be fulfilled : although, at the same time, he hopes, some of the hints contained therein, will not be undeserving of attention from the more experienced surgeon.

Having had frequent opportunities of observing that much mischief is often done by the too frequent and improper use of catheters, in certain diseases of the urethra, the author has added, in an appendix, some observations on the use of those instruments. These, he hopes, will likewise be found useful to such practitioners as are not much in the habit of using catheters ; as well as to those who are prosecuting their studies in this branch of surgery.

SOUTHAMPTON,
JUNE 4, 1793.

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ERRATA.

Page.	Line.
20,	18, for 40° read 80°.
57,	11, <i>longer</i> read <i>larger</i> .
112,	4, <i>pafs</i> read <i>press</i> .
144,	14, <i>ureters</i> read <i>urethras</i> .

OBSERVATIONS, &c.

INTRODUCTION.

IN cases of retention of urine, where, to evacuate the water by its natural passage, every method with which we are acquainted has been tried in vain, it is necessary, in order to save or prolong life, to make an artificial opening into the bladder. But practitioners are much divided in opinion respecting the part in which this opening may, with most propriety, be made.

Diseases of the bladder, and of its excretory duct, are very frequent ; but cases

B

of

of retention of urine, demanding the bladder to be punctured, are so rare, that in all probability it never has occurred, nor ever will occur, to any one practitioner, to meet with it in all the varieties of these diseases, and have an opportunity of judging from experience of the advantages, and disadvantages, of each mode of operating, in every peculiar disease. This leads me to think that the generality of authors who have treated on this subject have written from theory, or copied each other. Even those who have written from practical knowledge, seem most of them to have taken too partial a view of the subject. Having seen one mode of operating succeed, or fail, in one or two cases, they have supposed it preferable, or improper, in every case that can possibly occur.

Forming conclusions too general, from particular cases, is one grand source of the
diver-

diversities of opinion which so generally prevail upon many subjects in the different branches of medicine. No where is it more obvious than in this operation. Let us only take a view of the different diseases which render it necessary, of the changes in structure which the Bladder and its surrounding parts are capable of undergoing, in consequence both of healthy and diseased operations, and we shall be convinced that each mode of operating occasionally has its advantages, and that cases also occur in which one or other of the modes of operating is not disadvantageous only, but absolutely impracticable.

It is evident then, that in any cases where the propriety of puncturing the bladder is ascertained, before we can determine where the operation may be performed to most advantage, several things must be considered.

We ought to be very well acquainted with the natural structure and situation of the parts to be wounded, or in danger of being wounded, in each operation.

We ought to attend to the difference in the situation of these parts, depending on the peculiar conformation of different people.

Another thing to be considered, is the facility of the operation, both to the surgeon and to the patient. For an operation which may be safe, and even preferable, when performed by a surgeon who is a good anatomist, may be fatal when performed by an unskilful operator.

It is not sufficient that we preserve a patient's life merely by the operation, we must preserve also his future comfort and happiness; the consequences therefore of
each

each mode of operating, deserve our most serious consideration.

In a retention of urine there is always a diseased alteration in the structure and functions of the urethra, or of some part connected with it. It is of the utmost importance to ascertain this alteration, and the part in which it has taken place; as it will generally assist us in determining where to perform the operation, and oftentimes is alone sufficient to regulate our conduct.

In this essay I do not propose entering into long, and probably unnecessary details of the opinions of others; these may be gathered by reading their works. But I shall lay down what occurs to me upon the subject from my own observations, and from analogy. In doing this I shall in some measure pursue the following order.

In

In the first place, I shall give a short description of the anatomy of the parts, so far as the knowledge of it appears to be necessary in performing this operation.

Afterwards I shall speak of the symptoms attending on a retention of urine.

Then I shall describe the different modes of operating.

After this I shall take notice of the advantages, and disadvantages attending them, when the operation is performed on healthy parts.

Lastly, I shall point out those diseases, which occur to me as likely to have any considerable influence on the success attending the operation, or which may render one mode of operating preferable to another.

SECTION

SECTION I.

A SHORT ANATOMICAL DESCRIPTION OF
THE PARTS NECESSARY TO BE KNOWN
IN THE OPERATION OF PUNCTURING
THE BLADDER.

THE bladder is an organised bag, composed principally of a compact vascular membrane, which is covered with muscular fibres. The muscular fibres may be divided into two layers. The external layer extends from the fundus towards the cervix; the internal extends round it in a circular direction. Its internal surface is smooth, and covered with a mucus; the external surface is rough, being covered with

with reticular membrane by means of which it is attached to the surrounding parts.

The human bladder is of an irregular figure, and different from that of almost every quadruped, being smaller at its superior part or fundus than it is towards its cervix, which extends backwards, resting upon the rectum.

The bladder is situated within the cavity of the pelvis, immediately behind the symphysis of the pubes, on the anterior part of the rectum, with which it is in contact. Inferiorly it is confined by its connection with the prostate gland, and urethra; superiorly it is loose, and with respect to the surrounding parts, is differently situated at different times. Having a muscular power, it always adapts its capacity to its contents. When in an empty
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contracted state, the fundus is very near to the cervix ; and the whole of the bladder is situated, two inches or more, below the brim of the pelvis. As it becomes filled, its fundus gradually rises, and in a moderately-distended state, is nearly equal with the superior part of the symphysis pubes. In cases of preternatural distention it rises much higher, and may be felt in the hypogastric region ; and in some cases it has been known to rise above the umbilicus.

Superiorly, and posteriorly, the bladder is connected to the peritonæum. On examining these parts when the bladder is in a contracted state, we find this membrane lining the abdominal muscles, as low as the ossa pubes. During this course it is connected to them by reticular membrane, which towards the inferior part be-

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comes

comes very loose; so loose that, at about one inch and an half, or two inches above the pubes, it will admit of the peritonæum being separated from the muscles to a considerable distance. From the superior part of the ossa pubes, the peritonæum passes obliquely downwards, and backwards, to the fundus of the bladder; from thence it extends down its posterior part, and about opposite to the extremity of the os coccygis, it is reflected on to the rectum; over which it ascends, forming the meso-rectum.

When the bladder is distended with urine, it is evident that this peculiar situation of the peritonæum must in some measure vary. We find accordingly that, as the fundus of the bladder rises, carrying up that portion of the peritonæum by which it is covered, it separates, and raises
the

the peritonæum from the inferior part of the rectus muscle. This separation must take place in a greater degree, in proportion as the bladder rises higher in the abdomen.

It may be suspected that the process of peritonæum, which extends between the bladder and rectum, is raised at the same time; but the peritonæum is at this part more closely connected. The bladder also, here, is more fixed; and the situation of it is little changed in consequence of its being distended. As, however, it is capable of contraction, and relaxation, in every part, the distance between the reflection of peritonæum, and the prostate gland, must be greater when it is in a distended, than when it is in an empty state.

The bladder, at its inferior part, is connected to the ureters, vasa deferentia,

vesiculæ feminales, prostrate gland, and urethra.

The ureters pass down behind the peritonæum, and enter the bladder obliquely at its inferior part, about two inches from the orifice of the urethra, and about the same distance from each other. There is, therefore, little danger of wounding them, in the operation of puncturing the bladder.

The vasa deferentia pass into the pelvis under the peritonæum, and arriving at the posterior part of the bladder, they gradually approach each other, and come in contact between the bladder and rectum, about a quarter of an inch behind the prostrate gland, forming an angle of about 40° ; then passing parallel about one-third of an inch, each of them terminates

nates in the excretory duct of the corresponding vesicula feminalis.

The vesiculæ feminales are situated close to the outer side of the vasa deferentia : so that their posterior extremities are at a considerable distance from each other, and their anterior extremities are nearly in contact. Each of them sends off a small excretory duct, which receives the vas deferens of the same side. These ducts pass nearly parallel along a groove in the substance of the prostate gland, and terminate in the urethra, on each side of the caput galinaginis.

That portion of the bladder which is situated in the space bounded by the vasa deferentia, and the lower extremity of the meso-rectum, is in contact with the rectum. This portion is but small ; for
the

the part where the peritonæum is reflected, is not quite two inches from the prostrate gland. If we suppose a triangle, the sides of which are, each of them, one inch and an half long, and the base one inch and a quarter, its area, when inverted, will nearly correspond with the area of this portion of the bladder.

The prostrate gland is connected to the cervix of the bladder. It is of a somewhat flattened conical figure, and rather more than an inch in length. Its basis is towards the bladder; its apex towards the membranous part of the urethra. It lies upon the inferior part of the rectum, a little above the sphincter ani, as that intestine extends backwards towards the os coccygis. The prostrate gland may be felt by passing a finger into the rectum; and the vasa deferentia may, without much difficulty, be felt above it.

The

The beginning of the urethra is situated at the base of the prostate; it extends obliquely downwards and forwards, thro' the superior part of this gland, from its base to its apex. So that the prostate gland is situated principally at the sides of the urethra, but a small portion on its posterior part, and a still smaller on its anterior-superior part.

From the prostate gland, the urethra is extended a short distance, surrounded by reticular membrane, and a few muscular fibres: this is called its membranous portion. It is situated under the arch of the pubes, where it passes through a ligamentous substance. The urethra then enters the corpus spongiosum, at the superior part of the bulb. It is at a considerable depth from the perinæum; being covered by the integuments, a considerable quantity

tity of adipose membrane, and some muscles connected with the surrounding parts; and, as it forms a considerable curve, the posterior extremity, is deeper seated than the anterior.

SECTION

SECTION II.

OF THE SYMPTOMS PRODUCED BY A RETENTION OF URINE.

A Retention of urine is, strictly speaking, a symptomatic disease. It is a symptom arising from any disease which prevents the urine passing through the urethra; and the symptoms produced by it are secondary symptoms. But as the symptoms arising from the interruption of so important a function are always very formidable, and frequently fatal; although the disease giving rise to it is often, in other respects, free from danger; it has become usual to speak of a retention of urine as a primary disease, calling the disease which

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pro-

produces it the cause. Thus if a spasm of the urethra, or a disease of the prostrate gland, produces a retention of urine; the spasm or the diseased prostrate is said to be the cause; the retention of urine, the disease; and the effects produced by it are, by consequence, considered as primary symptoms.

This distinction being merely verbal, deserves little attention; but as it is convenient to our present purpose, I shall take the liberty of following it.

It is of the utmost consequence, however, always to recollect, that the causes of retention of urine are various, and give rise to various other symptoms; some of which at times are very formidable, and occasionally are so complicated with those symptoms arising from this disease, as to cause a considerable variety in them, and
some-

sometimes to increase their violence. As this will frequently occasion a considerable diversity in the treatment proper to be followed, the surgeon ought, in every case, to pay a strict attention to the discovery of the cause.

The symptoms attending on this disease are generally as follow. The patient feels an inclination to make water, but, on attempting it, finds himself incapable. The urine, not yielding to the action of the muscular power of the bladder, proves a stimulus to it; a stronger and more violent action is excited, and the patient feels considerable pain. This makes him afraid of straining: on the contrary, he endeavors to prevent the action of the bladder, and takes off, as much as possible, all pressure from it, by bending his body forwards. But there remains a very unpleasant, painful sensation, and a continual desire to void

the urine, arising from the distended state of the bladder, and which gradually increases as the disease advances. The bladder becoming more distended, its action, at last, becomes involuntary; and generally comes on in repeated fits. The muscular power of the bladder contracts violently for a short time, and then ceases, as if exhausted; the diaphragm, and abdominal muscles, and indeed all the muscles of the body, sympathizing with it, contract at the same time; and the patient feels a most excruciating pain.

During the fit, the patient, if standing, has his legs a little separated; his knee and hip joints half bent; his body bending forwards, his hands having fast hold of the bed-post, or any thing near him; and he seems excessively agitated: sometimes he squeezes the glans penis, fancying he can press some urine out of it. Now and then
a drop

a drop or two of urine comes away, occasionally tinged with blood.

The fits return, at different periods, in different cases ; but, in all, the time of their recurrence is irregular, and uncertain : frequently there is scarcely any interval between them ; frequently the interval is considerable. I have seen cases where the retention of urine was complete, and the intermissions between the fits were sometimes three or four hours ; at other times not five minutes.

Exactly such symptoms as these I have seen, where the bladder was in an inflamed state, and contained no urine. But, in the early stage of the disease, the continued local pain was greater ; and there was a considerable degree of fever ; which, in a simple retention of urine, is not the case. The patient is much hurried by the pain, and the

pulse sometimes is rather quickened, but not to that degree which I have observed when the bladder is inflamed: nor is there that prostration of strength and spirits which generally occurs in the latter disease. As the disease advances, however, the bladder becomes more irritable, and, at last, inflamed; the pulse quickens, and a considerable symptomatic fever comes on. All the symptoms increase, with frequent cold-sweats, and, sometimes, fainting, from the excessive pain. If the bladder was, previously, in an healthy state, it will admit a considerable quantity of urine before the symptoms become violent; and then, early in the disease, a tumor may be felt in the lower part of the hypogastric region. When this is the case, the nature of the disease is out of doubt. But sometimes, when the bladder is in an irritable state, three or four ounces of urine being retained in it, will produce all the symp-

symptoms above-mentioned ; and then, especially if the patient is rather corpulent, no tumor is perceptible. In this case, if the disease is not produced by an enlarged prostrate gland, the fluctuation may be felt on passing a finger into the rectum. If we do not succeed by this method, all the milder means for procuring the evacuation of the urine may be tried : but it is better not to think of puncturing the bladder. For, although there may be a retention of a small quantity of urine, the bladder must be so diseased, that, in all probability, the patient will not survive the operation.

If the patient is not relieved, as the disease advances, the hypogastric region becomes tender and painful, on being pressed ; this gradually increases, till the patient cannot bear the least pressure, without great pain : his pulse becomes quicker,
and

and weaker, and, at last, irregular. The continued pain, from the distention of the bladder, increases, and sometimes extends along the course of the ureters: the fits, and the increased pain produced by the temporary actions of the muscular power of the bladder, become weaker, and less frequent, till they cease entirely. The strength gradually sinks; delirium, and convulsions, come on; and, in a few hours, death closes the scene.

The symptoms now laid down were collected from cases which have fallen under my own observation. I have separated from them, as carefully as possible, those symptoms produced by the disease, causing the retention of urine; and those symptoms, also, which were produced by the means employed to remove it. I have seen two cases, where, from obstinacy, fear, prejudice, and other causes, little was
done

done to relieve the patients, and they died. In both, the symptoms were very much the same; except that in one case, the progress was more slow. A very small quantity of urine, now and then, came away, which seemed to prolong the patient's life; and he lived about thirty-six hours after the delirium, and convulsions came on.

We are told, by authors, that the bladder has sometimes been ruptured in this disease; but as I have never yet met with a regular detail of the symptoms attending it, I cannot say at what time this accident happened; whether the internal tunic gave way, during the violent action of the muscular fibres; or whether it did not occur till the life and texture of the bladder was destroyed, by the violence of the inflammation. The latter is, in fact, a mortification; and what seemed to take

E

place,

place, in the above cases. But I was not able, in either case, to ascertain the appearances, after death; as I could not obtain leave to open the body. I am inclined to think, however, that a rupture of the bladder is rather an improbable circumstance; unless in some peculiar cases of disease.

SECTION III.

OF THE DIFFERENT MODES OF PUNCTURING THE BLADDER.

THE bladder being deeply seated, and almost surrounded with bone, there are only three parts where we can, with any propriety, perform the operation of puncturing it. These parts are, the rectum, the perinæum, and above the ossa pubes. Hence the different modes of operating are commonly denominated, the operation *per ano*; the operation *in perinæo*, and the operation *supra pubes*.

Each of these operations has its inconveniences; is attended, frequently, with

considerable difficulty, and sometimes with no small degree of danger. In general, however, the danger attending cases where either of these operations is performed, is much more from the disease, than from the operation.

In speaking of these operations, I shall suppose that all the milder methods of relief have been previously tried, in vain; and that to puncture the bladder is the only means, which gives us a chance of saving, or prolonging, the life of the patient.

In order to obtain the greatest chance of success, in either of these operations, there is a certain period, or state of the disease, at which the operation ought to be performed. If we perform it before we have given all the milder methods of
cure

cure as fair a chance as possible, we shall often have recourse, unnecessarily, to an operation which, possibly, may terminate fatally, or end in an incurable fistula. On the other hand, it may be delayed too long; the bladder may become mortified, or ruptured, when it can afford no relief. Performing it then, will put the patient to unnecessary pain; his hopes, and the hopes of his friends, will be frustrated, and the operation will be undeservedly condemned.

To ascertain the precise period when it is unsafe to persist any longer in the use of milder remedies; and when, at the same time, these remedies have had as fair a trial as the nature of the case will admit of, requires our most serious attention. No invariable rule can be laid down.

When

When the symptoms of retention of urine are not complicated with dangerous symptoms from any other disease, the danger, as far as I have been able to observe, arises from inflammation, and mortification, taking place, rather than from the bursting of the bladder. If so, the proper period for the performance of the operation is, as soon as the inflammation is observed to be coming on, before it has time to increase to any alarming degree.

It is impossible to say, at what time, after the commencement of the disease, inflammation may take place; there are so many causes to occasion a diversity. The retention of urine is more complete on its attack, in some cases, than in others; the quantity of urine secreted in a given time; the capacity of the bladder; its irritability; and the general strength of the patient; are

are all of them circumstances which will vary, in different cases : infomuch, that two cases, agreeing exactly in the violence, and rapidity of their symptoms, will scarcely ever be met with.

The surgeon must attend, therefore, to the peculiar constitution of his patient ; the cause of the disease ; the rapidity, the violence, and the order of the symptoms. He should attend, also, to the means which have been attempted for his relief, and the effects which those means have produced.

As long as the patient is free from fever, and the pulse continues slow, or but little hurried, and there is no remarkable tenderness in the region of the bladder, or kidneys ; and as long as he has tolerable easy intervals, although the occasional action of the bladder may at times
be

be rather violent, and the pain attending it considerable; there does not appear to be much danger in waiting for the trial of other means. If, during the exertions, the patient shall void a little urine now and then, this also will give us time. Sometimes, after the action of the bladder, and the consequent pain have been very great for some time, they will nearly cease, even for several hours, and then return again. Here, great care should be taken not to be deceived into the notion that a rupture, or mortification, has taken place. The bladder continues distended, and, on being pressed to a certain degree, is sensible of pain. But the pulse and fever must form our principal guides: if the former is of moderate strength, slow, and regular; and the latter attended with no alarming symptoms, there is no immediate danger. It is better, however, to perform the operation too soon, than too late. Therefore, when-

ever

ever sufficient time has been obtained, to give all the milder methods of cure a fair trial, and they have failed, it is better not to wait till symptoms of danger come on, but to perform the operation immediately. Particular attention should be paid, that the means made use of for the relief of the disease, do not increase it. A great deal of mischief is often done to the urethra, by catheters being improperly used. So much inflammation sometimes is brought on, as to take away that chance which the patient would otherwise obtain from the operation.

When these things are attended to, the operation of puncturing the bladder, is less dangerous than is commonly imagined.

I. *Of the OPERATION per ANO.*

THIS operation is simple and very easy. It consists in making an opening through
F the

the rectum into the bladder, at that part where they are in contact with each other. It requires a knowledge of the situation of some few parts, in order to avoid wounding them unnecessarily; and this knowledge, with a little attention, is not difficult to attain.

The parts in danger of being wounded, unnecessarily, in this operation, are, the vasa deferentia; the vesiculæ seminales; and the process of peritonæum, which extends between the bladder and rectum. I have already noticed the situation of these parts. I observed that the vasa deferentia approach each other, obliquely, and come in contact, about a quarter of an inch behind the base of the prostate gland. I observed, also, that the process of peritonæum terminates opposite to the extremity of the os coccygis; which is about one inch and a half above the base
of

of the prostate. The triangular portion of the bladder, which is bounded by these parts, is connected to the rectum, by reticular membrane only, and may be punctured with the greatest safety.

Seeing the space, in which this operation may be performed, is small; it is absolutely necessary that it be accurately distinguished by the operator: therefore, the following observations may, probably, be worthy of notice.

The patient should be placed as in the operation of lithotomy. A finger should then be passed into the rectum, with its anterior part towards the bladder; and the operator should distinguish the prostate gland from the bladder. This is more difficult, on account of the bladder being distended with urine; and sometimes from the coats

of it being considerably thickened: but still it may be done, by moderate attention.

It will be found a little above the sphincter ani; and will be pressed against the rectum, so as sometimes to impede the passage of the finger. Above the base of the prostate gland, may be felt, the vasa deferentia, passing between the bladder and rectum. They are not quite so hard as they are nearer to the testes; but they are harder than the surrounding parts, and larger than in any other part of their course, and feel something like two cords. They lie very close to the edges of the vesiculæ seminales. The vesiculæ seminales may be distinguished by their being situated on the outside of the vasa deferentia; by the irregularity they produce; and by the fluctuation of the urine being less distinct through

through them. * Feeling for the part where the vasa deferentia come in contact, the finger should be passed directly upwards, about one inch. Here we shall feel the bladder very distinctly, pressing against the rectum. A trocar should then be passed along the fore-part of the finger, and pushed into it.

The trocar which is used, ought to be of a sufficient length, and curvature. I do
not

* It should be recollected, that the author is speaking, here, of those cases only, in which the bladder has undergone no change in its structure ; therefore, it will frequently happen, in cases where the operation is necessary, that the surgeon is not able to feel the vasa deferentia, and the vesiculæ seminales, so distinctly as is here described ; nay, that, sometimes, he is not able to feel them at all : but if the other rules here laid down are attended to, there is little danger of wounding them.

It is remarkable, that, when an obstruction to the passage of the urine forms, and increases gradually, the bladder gradually becomes thickened in its substance ; sometimes to an amazing degree. The increased resistance in the passage, not allowing the urine

not approve of the trocars, in common use; they are made circular in their diameter, and with a triangular point. I think an oval trocar is preferable; as it admits of a lancet-point. In most cases where a trocar is used, we wish the wound to be made in such a manner as will, as much as possible, favour its healing by adhesive inflammation. A small wound is more favorable to heal, than a large one; and a wound, the sides of which have a tendency to

to pass away so rapidly as before, the bladder is prevented expelling it so quickly with the ordinary force: this proves an additional stimulus to its muscular fibres, and they act with greater force. As the resistance increases, the stimulus, and the consequent action of the bladder, increases; and, as the action increases, the size and strength of the muscular fibres increase also. Common observation will shew, that, where a muscle, or a set of muscles, are exerted in an increased degree, for a length of time, they become gradually larger and stronger. These exertions prove an additional stimulus to the circulation in them; more blood passes thro' them, in a given time; and the actions, for their growth and nourishment, are carried on more rapidly.

to fall in contact, than one where they tend to recede from each other.

A triangular-pointed trocar appears, to me, to have two material objections.

The surface of a wound made by it, is greater than the surface of a wound made by a flat-pointed trocar of nearly the same size: the latter forms a longitudinal incision, having but two sides; whereas the former makes a triangular incision, consequently having three angles and six sides. Besides, it is an instrument badly adapted for cutting; and makes, in some measure, a lacerated wound.

The other objection to the triangular-pointed trocar, arises from the shape of the wound formed by it. The sides of a wound having three loose flaps, are, certainly, less favorable for falling in contact,

tact, than the sides of a longitudinal incision.

The consequences of these objections are ; that a greater degree of inflammation than is necessary, is brought on ; and there is danger of a suppuration taking place, when we wish to avoid it.

In every case of puncturing the bladder, I think, a lancet-pointed trocar is preferable. It can never be attended with inconvenience. Less surface of wound, in proportion to its size, is produced ; and, if it is proper to heal it before ulceration takes place, we are less liable to be disappointed.

Having withdrawn the trocar, and suffered the water to run out through the canula, the next consideration is, whether the wound is to be kept open, or to be healed.

healed. In this we must be governed by the cause of the disease. If that is of such a nature that it can be removed immediately, we must withdraw the canula. The sides of the wound, then falling in contact, will generally heal without further trouble. It will be proper, however, to take care, and prevent the part being irritated, by the fæces collecting in the rectum. For this purpose, emollient clysters may be used : but here, again, caution is necessary, that it be not irritated by the pipe ; by their too frequent repetition ; or by their being thrown in too forcibly.

Generally, however, the obstruction in the natural passage is of a more permanent nature ; and it is found adviseable to keep the new-formed passage open. For this purpose, we are, in general, advised to leave the canula, or a catheter, in the bladder,

der, through the rectum. This, I think, is not, altogether, a safe practice. The presence of an hard, unyielding body, in the rectum, is very disagreeable, and inconvenient, to the patient. It is continually irritating the parts, and exciting tenesmus ; and there is great danger of it producing ulceration, on the opposite surface of the bladder. If, in order to avoid the latter inconvenience, the extremity of the tube is introduced but just within the aperture in the bladder, it is liable to be forced out by the action of the rectum and levatores ani.

The difficulty of keeping a canula in the bladder, through the rectum, has been considered as a very principal objection to this operation ; which, otherwise, has several advantages. This objection may, in some measure, be obviated, by using, instead of a silver tube, a small catheter,

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or tube, made of elastic gum. It may be introduced, by passing it through the canula; which may then be withdrawn over it. This elastic tube, being soft, will adapt itself to the shape of the parts in which it is situated, and will yield readily to their action. An inconvenience attending the elastic gum canulas is, that, on being long immersed in a fluid, they become very soft; and then their elasticity is very easily overcome, by the pressure of the parts surrounding them. If they are made of linen, or silk, covered with elastic gum, this inconvenience is less liable to happen. Or a small male catheter may, occasionally, be introduced, through the tube.

After all, however, I am of opinion, that a tube is wholly unnecessary; and that, as long as the urine cannot pass by its natural passage, the artificial passage is incapable of healing.

If the operation is performed as I have advised, the muscular power of the bladder will lessen the extent of the wound very considerably; and, also, will bring its sides in contact. In consequence of this, we know that the coagulable lymph which is thrown out under the succeeding inflammation, will form a slight union between the parts, and serve as a medium, into which, if the parts are left a sufficient time at rest, the wounded vessels will, by degrees, extend; the union, by this means, gradually becoming firmer, until it is completed.

This process takes up some time. For the first ten or twelve hours, the union is very slight, and easily overcome by any force tending to separate the sides of the wound. When the bladder is empty, the stimulus from the urine being removed, its action will entirely cease; and the gravity

vity of the urine will not be sufficient to force it through the wound. But as it again gradually fills, the stimulus gradually returns; and, at last, is sufficient to excite the contraction of the bladder. The urine will then be pressed upon, in every direction, by the sides of the bladder; and, the natural passage being still impervious, it will be forced through the artificial opening. The sides of the wound will again fall in contact, and the urine will collect as before, until the bladder is again excited to contraction. This will continue to be repeated, probably, till the urine can pass freely by its natural passage.

The tendency to union, immediately after the operation, is great; and lessens after each time the wound is opened, until suppuration takes place on its edges; then
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there is no danger of its uniting till the urine can pass through the urethra.

When the passage of the urethra is opened, the bladder, meeting with less resistance from the urine, will press it with less force against the sides of the wound. These not being separated, as usual, granulations will gradually unite them.

It will be proper for the patient, at first, to attempt the evacuation of his urine, frequently—perhaps, every two or three hours; in order to prevent the union becoming too firm. Or the surgeon, if he chuses, may introduce an extraneous body, for a few hours, if it can be retained there; merely to keep the sides of the wound from falling in contact, during the first part of the adhesive inflammation. For
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this purpose, a bit of bougie, or an elastic gum canula, is preferable to any metallic instrument; as a soft substance will irritate less, and, by consequence, excite less inflammation, than an hard one. But, if the operation is delayed so long, that inflammation takes place in the bladder, the urine will not be retained by it, at least, for any considerable time. For a very small quantity of urine, even a single drop, sometimes, so irritates an inflamed bladder, as to excite the most violent contractions.

These observations receive great confirmation from a case related by Dr. HAMILTON, in the philosophical transactions, and mentioned, also, by Mr. JOHN HUNTER, in his treatise on the lues venerea. In this case, the catheter was withdrawn, immediately on evacuating the urine, and the bladder was found capable of retaining

ing what was afterwards secreted, until it was excited to contraction ; when the urine passed freely through the wound. This continued till the natural passage was opened ; which was in about two days ; and then the wound healed readily.

Probably, it will be objected, that this is the only case upon record, in which the power of retaining the urine has taken place ; and that a single case is not sufficient to establish a general conclusion. But, it must be observed, that, in most cases where this operation has been performed, a canula was left in the wound. No conclusions, therefore, can be drawn from those cases, against this opinion. It seems to me, to depend on the concurrence of several of the immutable laws of the animal economy, when in a state of health. If so, it will always take place where

where the parts are previously in an healthy state, and the operation is properly performed. *

Besides avoiding extreme inconvenience, pain, and trouble, the laying aside of the canula is attended with another advantage. The constant pressure of an hard body against the edges of the wound, proves a continual source of irritation; ulceration is excited, and the wound is thus made longer than is necessary. A continual adhesive inflammation, also, is kept up; and the coagulable lymph which is thrown out in consequence

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* My friend, Mr. FORSTER, of Broad-street-Buildings, surgeon to Guy's hospital, in a letter I received from him, a few days since, observes, that he has performed the operation per ano twice. In one case, not being called in till it was too late, the man died soon after the operation. The other case was in a man about twenty-four years of age, a soldier of the 22d regiment: he labored under a total retention of urine,
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quence of it, gives rise to a considerable thickening, and hardness, of the surrounding parts; lessening their vascularity, and living powers. Thus, forming a fistulous opening, that is difficult to heal, and, frequently, incurable; through which the urine will, perpetually, be passing, and ex-coriating the rectum.

II. *Of the* OPERATION IN PERINÆO.

THIS operation is usually described as being very simple and easy. To perform it properly, however, more dexterity in dis-

from a spasm of the urethra. After the operation, a canula was left in the wound, till the spasm abated; which was in about six hours. In about eight days, the artificial opening healed. During this time, the patient was capable of retaining his urine completely, and suffered no inconvenience; except that, when he attempted to make water, it came away in part through the urethra, and in part thro' the wound. April, 1793.

dillection, and a more accurate anatomical knowledge, is necessary, than falls to the lot of the generality of practitioners. Even where the operator has been a very good anatomist, I have seen this operation prove very difficult, and embarrassing.

The patient ought to be placed as in the former operation. An incision should be made on one side of the perinæum, through the integuments and cellular membrane; the dissection should be continued between the erector penis, and the accelerator urinæ muscles, through the transversus perinæi, and a portion of the levator ani, when the prostate gland may be felt. A trocar should then be passed into the bladder, on the outer-side of this gland, and rather anteriorly, that the vesicula feminalis may be avoided. It is easier to describe than to perform this operation. There is a great thickness of substance to pass thro',

which makes the dissection difficult, and dangerous, if the operator is not a good anatomist ; as parts are in danger, the wounding of which may be very distressing, if not fatal to the patient.

Formerly, it was a practice to thrust a trocar from the perinæum, at once, into the bladder ; and I have heard some, even at the present day, speak rather favorably of this practice. This random manner of operating, ought to be severely reprobated. The urethra is in great danger of being perforated ; and that, probably, in two or more places. The prostate gland is almost certain of being wounded, which is unnecessary ; and there is great danger of wounding the excretory ducts of the vesiculæ feminales, which are situated within it, by which the functions, both of the testes and the vesiculæ feminales will be completely destroyed. If, in order

to avoid these, the trocar is passed too much outwards, the ureters may be wounded; if too far backwards, the vesiculæ feminales, the vasa deferentia, or even the rectum, may be wounded. For the bladder is situated at such a depth from the perinæum, that is impossible with precision to direct the point of a trocar to any particular part of it.

After the operation, a canula ought to be left in the wound, otherwise the succeeding inflammation, and tension, will close it up; and we may, possibly, be under the necessity of repeating the operation. This, during the inflamed state which the part must be in, will be attended with extreme danger to the patient, and with great difficulty and embarrassment to the operator. The inconvenience attending the use of a canula, in this case, is inconsiderable. Care should be taken, that its extremity does not press against the
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bladder, with such force as to excite ulceration. As a sharp edge is more liable to cause ulceration, than a rounded surface, a female catheter seems to be a safer instrument, than a canula, to leave in the wound. The trocar to be used in this operation, ought to be of such a length that its canula may be about six inches long. The depth of the bladder, from the surface of the perinæum, is, in every case, very considerable ; and, in corpulent subjects, it will frequently be found that a shorter canula will not answer the purpose. No harm can happen from the trocar being too long ; as it need be introduced so far only as is necessary to draw off the urine ; but, if it should be too short, this will prove very embarrassing to the surgeon, and, sometimes, fatal to the patient, from the intention of the operation being frustrated. The trocar had better be of an oval form, for the reasons
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given in the operation per ano. Also, it will pass with more ease; with less pain to the patient; and less violence to the parts, which is another advantage very worthy of attention, as the parts through which it is to be passed are of considerable thickness.

III. *Of the OPERATION above the PUBES.*

WHEN the bladder admits of such a degree of distention, that the fundus of it rises above the ossa pubes; and when, at the same time, the patient is not so corpulent as to prevent the bladder being distinctly felt; this operation may be performed, with ease and safety.

A puncture about half an inch in length may be made, with a large-sized lancet, a
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little on one side of the linea alba, between it and the usual situation of the pyramidalis muscle. The inferior edge of this puncture may be half an inch, or less, above the os pubis. A trocar, similar to that described in the last operation, but shorter, may then be passed obliquely downwards, and thrust into the bladder; when the water may be drawn off.

As the urine will continue to pass thro' this passage, until the natural passage is opened, a canula ought to be kept constantly in the bladder. If this is not attended to, the urine, on passing out of the bladder, will get into the loose reticular membrane surrounding it, and cause inflammation and suppuration.

Whether the bladder is capable of retaining the urine, until it is excited to contraction by the bulk of it, I cannot say.

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It is probable it is, in some degree, though not so perfectly as in the operation per ano : for the bladder is rather thinner at its anterior-superior part, than it is, posteriorly, towards its cervix ; and, as it is surrounded by a very loose reticular membrane, the edges of a wound in it, cannot fall so firmly together, as those of a corresponding wound in the latter part. Besides, the thickness of the bladder being less than the thickness of the parts wounded through the rectum ; the resistance to the passage of the urine, from the adhesive inflammation, cannot be so great.

Supposing the bladder to be capable of retaining the urine, and of expelling it, at intervals ; still the objection is not removed. The space through which the urine must pass to the external orifice, when the bladder is in a nearly contracted state, is very considerable ; and the reticular mem-

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brane filling this space is so very loose, that the greater part, if not the whole of the urine, would, even then, be retained and diffused through it.

The canula belonging to the trocar is, by no means, a proper instrument to be left in the bladder; for its sharp edge is liable to excite ulceration. A small, male catheter, as recommended by Mr. HUNTER, seems to be as good an instrument as any. If made of elastic gum, it will, I think, be preferable; as it will stimulate less, and adapt itself better to the forms and actions of the parts in which it is situated. It may be introduced on a piece of curved wire; and, to prevent its slipping out of the bladder, the end of it may be passed just within the urethra, and retained there, when the irritation it produces is not too great. The wire should be withdrawn a little way, or it had better be withdrawn
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entirely, if the catheter is firm enough to remain in its situation without it. The upper end of the catheter should then be fastened to a bandage going round the abdomen.

SECTION IV.

OF THE ADVANTAGES AND DISADVANTAGES ATTENDING THE DIFFERENT MODES OF PUNCTURING THE BLADDER.

HAVING given a general description of that practice which appears to me the best to be followed, in performing each of the operations ; I proceed now to consider the advantages, and disadvantages, attending them ; still supposing the surrounding parts to be free from disease.

When a retention of urine takes place, and the bladder is distended to such a degree, that there is reason to fear mortification,

cation, or a rupture, (the consequence of which is the death of the patient,) we, in order to prevent these accidents, evacuate the urine by puncturing the bladder. But, in performing the operation, the evacuation of the urine is not the only consideration to be had in view. It should be considered, also, how the operation may be performed, with least danger to the patient, and most to his future advantage.

To render the operation as successful as possible, in both these respects, besides the attention necessary to prevent it being deferred too long, the following appear to be among the principal difficulties which the attention of the surgeon is required to obviate.

I. The danger of wounding parts, the wounding of which may destroy any important

portant functions of the animal economy, or life itself.

II. The danger to the system, from the operation; and its consequent symptoms.

III. The danger of the urine getting into the surrounding parts.

IV. The difficulty of managing the wound in such a manner, as to keep it open as long as may be necessary; and to heal it, when the natural passage shall be restored.

V. The facility of the operation to the surgeon.

These I shall consider under separate heads.

I. *Of*

I. *Of the PARTS in DANGER of being WOUNDED, in each OPERATION; and the CONSEQUENCES of wounding them.*

WHEN the operation is performed above the pubes, the only part, of any importance, that is in danger of being wounded, is the peritonæum. When the bladder will suffer distention, so much as to contain a considerable quantity of urine, and be easily felt above the pubes, there is no danger of wounding this membrane: but, frequently, in cases requiring the operation, the bladder is so extremely irritable, that the most violent symptoms are produced, by the retention of a very inconsiderable quantity of urine. In these instances, the bladder can be felt but indistinctly; and sometimes not at all, through the abdominal muscles; more especially in corpulent subjects; and
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then there is great danger of wounding the peritonæum.

The consequences of wounding this membrane, are very serious. There is great danger of inflammation taking place, over the whole cavity; which most commonly terminates in the death of the patient. If the peritonæum is wounded, in this operation, danger of inflammation taking place arises, from two causes.

If the edges of the wound do not unite by adhesion, the inflammation gradually extends, by a sort of sympathy, over the whole cavity of the peritonæum; or, till adhesion takes place, between some part of its sides, forming a lesser cavity, as now and then is found to happen. This lesser cavity will then circumscribe the inflammation.

The urine getting into the cavity of the peritonæum, acts as a second cause; either to excite inflammation, or to increase it when already excited.

On account of this inconvenience, it ought to be a rule, not to attempt the operation above the pubes, unless the bladder can be distinctly felt. In thin, emaciated subjects, the bladder can be felt above the pubes, when it is but moderately distended; but, as the subject is more corpulent, the difficulty, in distinguishing it, is greater; and, in some very corpulent subjects, it is not to be felt, even when distended to a considerable degree. In these cases, if we are satisfied that the bladder is so distended as to rise a considerable way above the pubes, the thickness of the parietes of the abdomen is so considerable, as to render the operation very difficult, and the situation of the peritonæum very uncertain.

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For these reasons, I think, the operation ought not to be performed in this part, in corpulent subjects, when it can possibly be avoided.

When the operation is performed per ano, the parts which it requires most attention to avoid, are the peritonæum, the vasa deferentia, the vesiculæ feminales, and the prostate gland. I have already observed how these parts may be avoided; and shall now speak of the consequences of wounding them.

The consequence of wounding the peritonæum, at this part, may be the same as of wounding it above the pubes. But as the part which is liable to be wounded is more depending, there is less danger of the urine getting into its cavity: and if the patient lays with his back somewhat raised, the gravity of the urine gives it a tendency to pass

pass into the rectum. Another, and a still more important circumstance in favor of wounds in this part of the peritonæum, is that, the sides of it being in contact, adhesive inflammation, under proper attention, will generally take place; and when it does, neither the urine, nor the inflammation, can extend further. But I do not, from this observation, wish it to be understood as considering a wound of the peritonæum, at this part, a matter of slight consequence. We do not know that adhesive inflammation will always take place; and, if it fails once in an hundred times, this is a sufficient reason to make us always carefully avoid wounding it.

If either of the vasa deferentia is wounded, it is most probable the cavity of it will be obliterated. It is possible, however, that the wound may penetrate into some of the cells only; when the wound may

heal, without destroying the functions of the duct.

Obliterating the duct produces the same effect as removing one of the testes. The danger of doing it, therefore, deserves consideration ; and it may, I think, be avoided, by moderate attention. But, even if it should accidentally be wounded, the consequence is nothing, compared with the additional danger which may, sometimes, attend the life of the patient, from the operation being performed in another place.

I do not know that wounds of the vesiculæ feminales, are attended with any serious consequence. They generally, as far as I can learn, from cases where they have been supposed to be wounded, heal as readily as most other parts ; and, if one of them should be obliterated, from what we

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at present know of their functions, we have no reason to believe that it will be attended with any material inconvenience to the patient.

The prostate gland ought to be attentively avoided ; which, when it is in a sound state, may be done with great ease. For, besides wounding a part which is sometimes difficult to heal, both the ducts of the vesiculæ feminales are almost certain of being wounded. If this happens, the functions of both testes, and both vesiculæ feminales, are cut off.

When the operation is performed in perinæo, the parts which ought to be avoided, are the urethra, the prostate gland, the vesiculæ feminales, and the rectum.

I before observed, that the only way to avoid these parts, with certainty, is carefully
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to dissect down to one side of the prostate gland, before the trocar is introduced. In doing this, a great deal of care is necessary, to avoid wounding the urethra. If the urethra will admit an instrument to pass into the membranous part of it, a catheter had better be introduced. As far as it extends, it will point out its situation; and, if an instrument cannot be passed into the membranous part, it will seldom be necessary to puncture the bladder: as the water may, generally, be evacuated, by puncturing the urethra above the part which resists the instrument.

The consequence of wounding the urethra is, in general, extremely disagreeable. If the wound be no more than a puncture, or be a strait incision through one side only, it may, possibly, heal without any trouble; but, frequently, the wound is such, that union cannot take place, and an incurable

curable fistula is produced. It has frequently been wounded in two, or more, places; and I recollect hearing of a case, not long since, in which it was completely divided.

The prostate gland is a substance, in which the powers of restoration are less than in some other soft parts: and altho' when in an healthy state, recent wounds of it are found to heal, without difficulty; yet, when diseased, or when it is necessary to keep the wound open for some days (as is frequently the case in this operation), it ought to be avoided, as there is great danger of the wound becoming fistulous. There is also the same danger of wounding the ducts of the vesiculæ feminales, as in the former operation.

The other parts which I have observed ought to be avoided, are so far out of the
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way, that they are in little danger of being wounded, except through ignorance, or inattention ; and, therefore, the risque of wounding them affords no objection to this operation.

II. *Of the DANGER to the SYSTEM from each of the OPERATIONS, and the CONSEQUENT SYMPTOMS.*

WHEN an operation is performed, in parts where the simply wounding of them does not endanger life, and where the living powers are nearly equal, the danger from the operation is in proportion to the quantity of inflammation which is produced ; and this again is, in great measure, in proportion to the quantity of surface wounded. Therefore, as there is less surface wounded, in puncturing the bladder, where it is most superficial, this part ought
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to be preferred; unless something of greater importance occurs to prevent it.

In the operation per ano, the surface of the wound is very small; too small to produce inflammation sufficient to affect the constitution generally.

In the operation above the pubes, when the patient is moderately thin, the surface of the wound is much greater, than in the operation last-mentioned. But, still, the inflammation produced, is not so great as to affect the constitution.

When the operation is performed, in perinæo, the surface wounded is very considerable; the violence done to the parts, is, sometimes, not much less than in some cases of lithotomy. There generally is a considerable symptomatic fever; and the

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constitution is sometimes so much affected, as to endanger the life of the patient. This danger will become more serious, if the patient suffers much by the retention of urine, previous to the operation.

It can hardly be necessary to observe, that, after either of these operations, the patient should be kept perfectly quiet; and that the antiphlogistic plan should be attentively followed.

III. *Of the ADVANTAGES of each OPERATION, in EVACUATING the URINE.*

THE part where the operation is performed, ought to be as favorable as possible for the evacuation of the urine; that it may not collect in the surrounding parts.

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This is a very important consideration. If the urine cannot be freely evacuated, and that, too, as long as may be necessary, the end of the operation is not answered: the life of the patient may not be saved; or another disease may be introduced, under which the patient will drag out a miserable existence.

If the opinion I have delivered, in speaking of the operation per ano, be just, I think that operation must be allowed to possess this advantage, in the greatest degree. The thickness of the parts through which the urine passes, is inconsiderable; the reticular membrane connecting them, is too firm to allow the urine to collect in it; and the retentive power of the bladder still continues. So that the patient suffers very little inconvenience, except when he wills to expel his

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urine, or fæces. In the former of these cases, the urine may sometimes rather irritate the rectum, and cause a slight tenesmus; in the latter, the increased sensibility of the wounded part may be productive of pain, during the action of the muscles: though the action of the muscles may, in great measure, be prevented, if we remove the cause of it, by the frequent use of emollient clysters.

If the urine should pass continually into the rectum, as must now and then be the case when the wound has been a long time open, it will be rather disagreeable; as it will irritate, and excoriate this part. In this case, the parts should be defended, as much as possible, from the acrimony of the urine, by means of some oily matter.

In the operation in perinæo, a canula ought to be kept constantly in the wound.

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If this is not done, the sides of it will be pressed together, when the urine will not pass freely ; and, if much inflammation takes place, a complete retention will often be re-produced. If, at this time, we are able to introduce an instrument, it will be with great difficulty, and will put the patient to extreme pain. I think a metallic canula, preferable to one of any softer materials ; for the latter, in a short time, will become so soft that, being incapable of resisting the tumefaction which takes place in the wound, its sides will be pressed together.

When the operation is performed above the pubes, on the bladder contracting, the opening in it recedes, a considerable way, from the external opening ; and, if a tube is not kept in the wound, to convey the urine externally, it diffuses itself into the surrounding reticular membrane ; which
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it irritates, producing inflammation, and its consequences—adhesions, abscesses, fistulas, &c. These, from their situation, are out of the reach of art, or nearly so. Considerable symptomatic fever, and hectic symptoms, are produced; which generally terminate in death.

The danger of these unhappy consequences, is a great objection to this mode of operating; and, when it is put in practice, renders the greatest attention necessary, in order to prevent them. A good deal of art is necessary in managing the canula, in this case. If it is not sufficiently large to fill up the orifice in the bladder, the urine will escape by the side of it. This is less liable to happen while the wound is recent; for then the wounded edges of the bladder are capable of contracting round a tube which is smaller than the trocar;
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more especially, if the wound is a longitudinal one: but, when the wound has been long open, the coagulable lymph which is thrown out, will render the edges of it hard, and incapable of contracting. It is very difficult to keep a canula which is strait, or nearly so, in the bladder, without doing mischief. If it is introduced too far, it will press against the opposite side of the bladder, and cause ulceration; if, on the other hand, it is very little too short, it will perpetually be slipping out of the orifice; which is very unpleasant, as the introducing of it again is attended with considerable difficulty. I have, therefore, recommended a male catheter to be used; as directed by Mr. HUNTER. But, in the use of it, great attention is necessary; or it will irritate the neck of the bladder, to such a degree, that it will be necessary to remove it.

IV. *Of the DIFFERENCE in the FACILITY with which the WOUND may be KEPT OPEN, or HEALED, after each OPERATION.*

WHEN we consider that the ease, or difficulty, of healing the external opening, depends, in most cases, on the facility with which the opening in the bladder heals; and that the structure of the bladder, being nearly the same in all the parts where it is punctured, its power of healing cannot differ much; we are naturally led to suppose, there can be no great difference in favor of either operation, in this respect. When the urine can pass by its natural passage, and the wound can be permitted to heal soon after the operation, I do not think there is any material difference; either of them, in healthy subjects, will heal without much difficulty: but, when
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it becomes necessary to keep the passage open, for a length of time, the wounded parts undergo such changes, as render them more difficult to heal. In consequence of situation, and in consequence of other circumstances, these changes will somewhat differ in the different parts.

In the operation above the pubes, it is necessary, as I before observed, that the canula should be kept constantly in the wound. This extraneous body proves a source of irritation, by which a continual inflammation is kept up: this inflammation is partly suppurative, and partly adhesive. A coagulable lymph is constantly being thrown out of the inflamed vessels, into the surrounding parts, producing a considerable thickening and hardness of them; at the same time, there is great danger of sinuses forming. If the patient should survive till this change has taken

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place, and the natural passage should then be opened, on the instrument being withdrawn, the edges of the wound in the bladder will have become so firm and hard, as to be incapable of contracting; and the urine will, for some time, escape into the reticular membrane, producing the same unhappy consequences, as when it escapes immediately after the bladder is punctured. For, in order that the wound may heal, it is necessary that granulations form, and fill up its space; and that the greater part of the coagulable lymph be removed by absorption. This, from the weakness of the living powers in the part, must be a work of some time; and, frequently, the wound will not heal at all.

In the operation in perinæo, we are, in some measure, liable to the same inconvenience as in the former operation; that is, the wound being unfavorable for healing;
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although, from the difference in the structure of the surrounding parts, the urine is less liable to get into them : but, now and then, the external wound will close ; the wound in the bladder continuing open. When this is the case, very troublesome abscesses, and deep-seated, complicated fistulas, are liable to be produced.

When the operation is performed per ano, very different opinions have been entertained ; some saying that the wound produced here is more favorable for healing, and others, that it is more unfavorable, than in either of the other operations : and both parties sometimes call in experience to support their opinions. Cases, no doubt, have occurred, where the wound has not healed after the natural passage was restored, but has continued fistulous ; and the urine, by constantly passing through it into the rec-

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tum, has proved very troublesome. But, in these cases, I am of opinion that either sufficient attention was not paid, in performing the operation, the opening being made too large, or not in the proper place ; or the parts were, previously, in a diseased state. For there are several cases upon record, where this operation was performed, with success ; and, in some of them, a canula was kept in the wound constantly for four or five weeks ; when, the urine passing through the urethra, it was removed, and the wound healed in a very short time. I can see no reason why this should not always be the case, when the operation is performed with attention. If care is taken to prevent the bladder being too much distended with urine, the urine will not prevent the healing of the part ; and experience proves, also, that the fæces can do no harm, even should they get into the wound ; which, if the wound is made as
small

small as it ought to be, will seldom be the case. If the canula is laid aside, and is had recourse to, only when necessity requires it, a material advantage will thus be obtained over the other operations : for this cause of irritation not being present, the sides of the wound will not become so thick and hard ; by consequence, the powers of restoration will be greater, and the wound will heal in a shorter time.

V. *Of the FACILITY of each OPERATION
to the SURGEON.*

THE last consideration which now occurs to me, when the operation is performed on sound parts, and in an healthy subject, is the facility of the operation to the surgeon.

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To a surgeon who is acquainted with the anatomy of the parts, and accustomed to dissection, this consideration ought to have but little weight; as he knows how to avoid wounding those parts which ought not to be wounded, and is able to perform each operation with as much ease and safety as, from its nature, it will admit of: but as this operation, when indicated, admits of no delay, it often happens that a practitioner must perform it who has not these advantages. In this instance, it will generally be proper for the surgeon, on his own account as well as on the account of his patient, to perform the operation in that manner which is easiest and attended with the least danger of wounding any important part; although some objections may occur, which would, otherwise, forbid it.

If the patient is not very corpulent, and the bladder admits of a moderate degree of distention, the operation above the pubes is the most safe and easy; but when the bladder cannot be felt above the pubes, either from its not admitting of sufficient distention, or from the corpulency of the patient, this mode of operating is embarrassing, and even dangerous.

The operation per ano is, by no means, difficult: the rules for performing it are few, and easy to be observed; and, by attending to them, the operation may be performed by a person who is ignorant of practical anatomy, without danger, at least to the life of the patient.

The operation in perinaeo, I before observed, is very difficult; and, sometimes, embarrassing. If it can possibly be avoided, it ought not to be attempted by a person

son who is not well acquainted with the structure, and situation, of the parts concerned.

Having now considered what has occurred to me as worthy of notice, both against and in favor of each mode of puncturing the bladder, when the operation is performed on a subject in whom the parts have not undergone any considerable diseased change ; I proceed to make some observations on those diseases which ought to influence our conduct in determining which mode of operating is preferable in particular cases.

SECTION V.

OF THE DISEASES WHICH, BEING PRESENT WITH THE RETENTION OF URINE, OUGHT TO INFLUENCE THE SURGEON, IN DETERMINING WHICH OPERATION IS PREFERABLE.

WERE each of these diseases to be fully considered, this would open an extensive field for enquiry ; but to give a complete history of them, is foreign to the intention of this essay. I shall attempt to consider them, so far only as they are connected with these operations.

In this point of view, they may be divided under two heads.

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I. Those

I. Those which give rise to the retention of urine; and, II. Those which are accidentally present in the surrounding parts.

I. *Of those DISEASES which GIVE RISE to the RETENTION of URINE.*

UNDER this head come to be considered some of the diseases of the urethra, of the prostate gland, and of the bladder itself.

The diseases of the urethra, which I think it necessary to notice, are stricture, spasm, inflammation, calculi, and excrescences in the urethra.

I do not think that either of these diseases, singly, except spasm, can produce a retention of urine, so permanent as to render the operation necessary. Strictures form gradually;

dually ; and, before they completely close the urethra, a new passage is always formed. If a small calculus gets into the urethra, and produces a retention of urine, when it is near the neck of the bladder, it may be pushed back into it ; and when it can be come at, externally, it may sometimes be brought forwards, by a gentle pressure being made with a finger behind it : if this does not succeed, it may be cut upon, and thus removed.

A calculus, too small to fill the diameter of the urethra, may get into it, and be retained behind a stricture, when it will gradually become increased in size ; but then a groove will be formed in it, thro' which the urine will pass. The same will happen where there is no stricture, if a calculus should be retained in the urethra any considerable length of time. If a spasm affects an urethra that was previously

in a sound state, it generally yields to proper treatment; nor, in any instance with which I am acquainted, has inflammation of the urethra caused a permanent retention of urine, indicating an operation.

But a retention of urine is, sometimes, produced by a conjunction of two, or more, of these diseases. Persons who labor under a stricture, are very subject to spasm at the strictured part, producing a very obstinate retention of urine, that will sometimes frustrate every milder method of treatment. In these cases, the action which, after a certain time, takes place in the bladder, for the expulsion of the urine; and frequently, also, the inflammation produced by the repeated attempts to draw it off; increases the violence of the spasm, or continues it after it would otherwise have ceased. When we judge this to be the case, we expect that, on removing the
water,

water, the inflammation, and spasm, will cease, and that we shall then have the stricture only to remove.

To evacuate the water, in this case, it is not necessary, always, to puncture the bladder; for, if the stricture be even in the membranous part of the urethra, (as, indeed, it most frequently is,) and is not very close to the prostrate, an incision may sometimes be made into the urethra, beyond it. For where a stricture has continued for a considerable time, that portion of the urethra above the stricture, often becomes considerably enlarged. When this is the case, and the patient is rather thin, if a catheter is passed gently up, close to the stricture, in order to point out its precise situation, and, a finger being placed immediately above it, the patient is desired to attempt the expulsion of his urine, an obscure fluctuation may, frequently,

quently, be felt. * Into this, a puncture should be made. We may then wait till the inflammation, and spasm, have ceased; when we shall be able to turn our attention to the removal of the stricture.

If the stricture is so situated that we cannot cut into the urethra beyond it, or if, being situated, in or near the membranous part, we cannot trace it by the mark I before laid down, the bladder must be punctured; and the only object of consideration is, where this can be done to most advantage.

I should, if possible, avoid performing it in perinæo; as, independent of the preceding

* I met with a case of this kind, about four years since, where I could plainly feel a fluctuation: but the family-surgeon expressing very great doubts to the patient about the success of an operation which prejudice had taught him to look upon as always fatal, the patient obstinately refused to submit to it, and died.

ceding observations, from its vicinity to the diseased part, the inflammation may increase more, and spread further, than it otherwise would.

If I thought that, after the spasm was abated, I could pass a bougie beyond the stricture, I would perform the operation per ano: but if there is reason to apprehend that this cannot be done, I think the operation above the pubes is preferable, as then we are able to attempt the removal of the stricture; according to a plan recommended by Mr. HUNTER. This is, to pass a curved canula through the bladder, as far as the stricture, and a strait canula thro' the external portion of the urethra; when, getting the strictured part between the two canulas, it may safely be perforated with a piercer.

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I saw a case, not long since, where a calculus was lodged in the membranous portion of the urethra, it had increased gradually to a considerable size; and, inflammation accidentally coming on in the part, a retention of urine took place, under which the man died. The surrounding parts were so much inflamed, and so tumid, that it appeared improper, if not almost impracticable, to extract the stone, at that time. But had the bladder been punctured, either per ano, or above the pubes, the urine would have been evacuated, and the inflammation, which was much increased by its retention, would, it is most probable, have subsided; then the stone might have been extracted, and the life of the patient, probably, have been saved; at least, a chance would have been obtained, which, from nothing being done, was inevitably lost.

Another set of causes, producing a retention of urine, are, some diseases of the prostate gland.

We are not so well acquainted with the diseases, to which this part is subject, as could be wished. There is, however, a disease of this part which is, frequently, the cause of a retention of urine. At what time of life this disease, generally, first commences, I cannot say; but that state of it which gives rise to a retention of urine, is, by much, the most frequent in old people, though not peculiar to them: I have seen it in a person below the age of forty. In this state, the prostate gland is six or eight times its natural size. Instead of lessening, it increases the size of that portion of the urethra which is situated within it, rendering it both wider and longer; but, at the same time, increasing

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its incurvation. In consequence of its increased size, and of the change it undergoes in form, the sides of it, and its posterior portion, extend into the cavity of the bladder, giving the appearance of two or three tumors; sometimes of equal, sometimes of different sizes. These, falling together, act as valves to the urethra, preventing the free evacuation of the urine. They are so situated as to fall together, spontaneously; the consequence of which is, that they are pressed together with greater force, in proportion as the bladder becomes distended with urine. A person will, sometimes, bear this disease for several years, without any very great inconvenience, provided he is careful to void his urine frequently; but, if he neglects it for some time beyond the usual period, he will not be able to void it at all.

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The operation is not always necessary, in these cases; for, frequently, by proper attention, and a little dexterity, a catheter may be passed into the bladder. Occasionally, however, the surgeon is not so fortunate; and the patient has no chance for his life, but from the bladder being punctured.

As retentions of urine are met with at different periods of the disease we are now speaking of, I shall, with respect to the operation, divide it into two states; which will give rise to some diversity in our practice.

1. The prostate gland may be enlarged to a considerable size, without giving the patient much trouble, provided he is attentive not to suffer the urine to collect in too large a quantity. In this state, inflammation may come on, and produce a reten-

tion of urine. The same effect may be produced by allowing the urine to collect in too large a quantity. Or both these causes may act together, the one increasing the other.

2. The prostate gland may be so enlarged, and in such a diseased state, that the patient is harassed by frequent returns of the retention of urine.

In the first state of the disease, there are two or three causes co-operating, in producing the retention of urine; and we have reason to believe, that, if we can remove those causes, which are temporary, the patient, at least for a time, may be tolerable comfortable. The enlargement of the prostate gland, it is most probable we shall find difficult to remove: but the inflammation, or the urine, may generally be removed by art.

A case occurred to me, about two years since, in which the prostate gland was diseased; but the patient could void his urine with tolerable ease, till one day, after walking the distance of several miles (during a considerable part of which he resisted a great desire to make water, for want of a convenient opportunity), he found himself unable to void his urine at all, altho' he made repeated and violent attempts. He was bled, medicines were given internally; and several attempts were made to introduce a catheter, but with no good effect. The next morning I saw him, when he labored under a considerable symptomatic fever, with great tension and tenderness of the lower part of the abdomen. The bladder was, evidently, very much distended, and the patient was amazingly distressed by its frequent and violent contractions; during which, a single drop, or two drops, of urine, now and then, came

came away, tinged with blood ; and, upon enquiry, I found that a considerable quantity of blood had come away, after the different attempts to introduce a catheter. Suspecting the cause of the disease, I passed my finger into the rectum : in doing this, I found considerable difficulty ; partly from the very irritable state of the rectum and sphincter ani, and partly from the extreme pain I gave the patient by pressing against the urethra and prostate gland. I found the prostate very much enlarged ; but was able to get the end of my finger beyond it. As the parts were in such an inflamed and irritable state, and as I thought the introducing of a trocar so far up the rectum, under the difficulties which I found I must encounter, would prove very embarrassing, and, in some degree, dangerous ; and as the patient, at the same time, was rather thin ; I had resolved, if the operation became necessary, to perform

form it above the pubes ; where I could plainly feel the bladder distended with urine : but I thought it proper, first, to attempt the introduction of a catheter. After persevering in this attempt, for near one hour and a half, with very little interruption, I was so fortunate as to succeed in slipping the point of the catheter, before the projecting portion of the prostate gland, into the bladder. The patient, as may be expected, was instantly relieved ; and, by means of phlebotomy, perfect rest, low diet, cool air, fomentations, and repeated clysters, the inflammation was gradually reduced : but it was full a month before the patient was able to evacuate his urine, with tolerable freedom ; during the greater part of which time, I was under the necessity of drawing it off, every twelve hours. In doing this, for the first five or six days, I, in general, found great difficulty,

culty, and was sometimes half an hour, or more, before I succeeded ; but, at last, I found that, on bringing the extremity of the instrument to pass against a certain point of the urethra, with very moderate force, it suddenly slipped into the bladder.

As the acute inflammation abated, the prostrate gland became somewhat smaller ; but, when I ceased to attend the patient, it was three, or four times its natural size ; and, even then, probably, was very little larger than it was before this attack. For afterwards, upon enquiring the history of this man, I found that he frequently experienced some little difficulty in making water, and, that now and then, in consequence of violent exercise, or of retaining his urine too long, he had suffered a temporary retention, but never in so violent a degree as when I saw him.

About

About eight months after this, I met with another case, in every respect similar to that above described; except that the symptoms were somewhat less violent. It was near three-quarters of an hour before I succeeded in getting a catheter into the bladder, in this case; and it was nearly three weeks afterwards, before the urine could be evacuated without the assistance of a catheter.

But, as I before observed, we are not always so fortunate as to succeed in introducing a catheter; and the bladder must be punctured, or death ensue.

If, in this state of the disease, the prostate gland is not so enlarged as to prevent the finger being passed beyond it, with tolerable ease, the operation can be performed per ano; but, if the finger cannot

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be passed beyond the prostate, it ought not to be attempted in this part, if it can possibly be performed above the pubes. It is dangerous to attempt puncturing the bladder through the rectum, above the reach of the finger; and every one must see the impropriety of wounding the prostate, when in this diseased state. The disease will be hurried on more rapidly; and the wound, in all probability, will never heal. Indeed, the operation per ano is not the best (speaking generally), in any case of this disease. In each of the cases before related, I was able to feel the bladder, beyond the prostate gland; but the anus, sympathizing with the disease of the contiguous parts, was extremely irritable, and its muscles contracted so forcibly, that I found considerable difficulty in introducing a finger, and gave the patient a great deal of pain. There was greater ir-
ritability

ritability in the anuses in these cases, than in those cases I have met with where the disease was further advanced.

If the operation per ano is sometimes objectionable, on account of the danger of increasing the disease of the prostrate gland, the operation in perinæo must be always so: this gland being so enlarged, it is impossible to puncture the bladder, from the perinæum, without passing through it; and in a part, also, much thicker than the part which would be wounded, by passing a trocar thro' it, in the operation per ano. The disease of the prostrate will, also, be increased, by the inflammation arising from the extensive wound which must be made in the integuments.

The operation above the pubes, seems to have the preference in this state of the disease; as we can evacuate the urine by

that operation, without danger of increasing the cause of its retention ; and, as soon as we are able to pass a catheter into the bladder, through the urethra, it ought to be done, and kept, if the urethra will bear it, almost constantly there, until the artificial opening is healed.

In the second state of this disease, the patient is in the most melancholy situation it is possible to conceive. The disorder which the system suffers from the interruption of so important a function, gradually reduces it to a most emaciated and debilitated state : frequent returns of the most excruciating pain, destroy both his happiness and rest. From the continuance, and progressive increase, of the disease, every hope of relief, in this world, vanishes ; the spirits are agitated and exhausted, and death is implored to terminate his sufferings.

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In this state, a retention of urine, sometimes, comes on ; under which the patient sinks ; or, when the fit has been violent, he dies exhausted, after the water has been drawn off.

Now and then, before a retention of urine takes place, rendering the operation necessary, suppuration takes place in the prostrate gland ; which, becoming more general, gradually extends to the surrounding parts.

If, during this stage of the disease, a total retention of urine takes place, all that we can hope for is, to give a momentary relief from the pain ; and, perhaps, to prolong life a few days, or hours. The prognostic is so unfavorable, and the dread of cutting so great, that the patient himself will seldom submit to the operation ; nor will his friends, often, permit it. Indeed, I
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do not think it should be recommended, unless there is a prospect of the urine again passing by its natural passage; for it can be performed, with any degree of propriety, above the pubes only, and even this mode of operating has a very strong objection. For, although the operation may prove so far successful, that the patient shall survive this fit, the urine must pass through the artificial opening, during the remainder of his life: by consequence, it will be continually escaping into the reticular membrane surrounding the bladder, and exciting inflammation there; which must, necessarily, add to the misery of the patient, and increase the original disease.

In these deplorable instances, I think, it is not a bad practice to pass a catheter, the diameter of which is small, as far along the urethra as is possible, and then thrust
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it, through the projecting portion of the prostrate gland, into the bladder, leaving it there, if possible, till the inflammation induced by it subsided ; when the opening, if the patient lives, will, probably, become fistulous. If this mode is not preferred to the operation above the pubes, it may be had recourse to when that cannot : as, for instance, when the patient is very corpulent ; or when the bladder is not sufficiently distended, to be felt above the pubes.

The third set of diseases which I observed may cause a retention of urine, are those of the bladder itself.

The bladder is subject to a great variety of diseases. But cases of retention of urine, requiring the operation, in consequence of a disease of the bladder, are very rare.

Polypi

Polypi, sometimes, form, on the internal surface of the bladder, and prove extremely troublesome; giving rise to symptoms very similar to those depending on the stone, or a diseased prostrate. But a retention of urine caused by them is, generally, removed with great ease, by a catheter. It is possible that a small polypus, situated close to the neck of the urethra, may slip into it, and, a degree of inflammation, or spasm, coming on, may be retained so firmly, as to resist every attempt to pass a catheter.

When the neck of the bladder is become ulcerated, a fungus may form, from the diseased surface, and cause a retention of urine. But if this should not give way to the catheter, the substance is so soft that, it is more than probable, the instrument will pass through it.

Hydatids

Hydatids have been known to form about the neck of the urethra, and cause a retention of urine; but they also will, generally, yield to the force of the catheter.

In any of these cases should it become necessary to puncture the bladder, if the prostrate gland and the parts surrounding the anus are free from disease, I prefer the operation per ano.

There are some other diseases which are said, occasionally, to produce a retention of urine; but as they will give rise to no new observations respecting the operations for relieving it, it is not necessary to speak of them here.

Therefore, I proceed now to the second class of those diseases which ought to influence our conduct in determining where to puncture the bladder.

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Of

Of the DISEASES which may ACCIDENTALLY be PRESENT in the SURROUNDING PARTS.

OF these, I shall say but little; it being sufficient for our purpose, merely to mention them, and point out the inconveniencies attending the operation, when performed in a part where they are present.

When a patient is troubled with hæmorrhoides, caution is necessary in puncturing the bladder through the rectum; for, in some cases, the vessels are considerably enlarged, and may give rise to a troublesome hæmorrhage. From the increased thickness of the cellular substance about the rectum, the parts are more difficult to distinguish; especially, the vasa deferentia, and vesiculæ seminales. A still greater in-

inconvenience may arise, from the unhealthy state of the parts diminishing their powers of restoration; in consequence of which, the wound is more liable to become fistulous.

It is not every case of piles that can render this operation improper. If they are not very large, nor situated high up the rectum, they need not, I think, be much regarded. But no general rule can be given which will, invariably, distinguish when this, or either of the other modes of operating, ought to be avoided: it must be left to the judgment of the surgeon; and that judgment must be regulated by considering all the objections to the different modes of operating, and this amongst the rest.

In cases of scirrhus rectum, the operation ought, by no means, to be per-

formed per ano ; it is hurrying the patient on to destruction : violent pain, and inflammation, will be produced ; and life will, inevitably, be shortened.

Abcesses, and fistulas about the anus, ought to prevent our performing the operation per ano, if it can possibly be done in another part.

Abcesses, and fistulas, in perinæo, are an objection to the operation in that part ; unless we have reason to believe that we can perform an operation to relieve them, at the same time. Even then, I think it a dangerous practice.

CONCLUSIONS.

FROM the observations laid down, in the foregoing pages, the following conclusions are drawn.

I.

A retention of urine is, strictly speaking, a symptomatic disease. It is a symptom arising from any disease which obstructs the passage thro' the urethra ; and when that disease can be removed, this symptom immediately ceases.

II.

The parts concerned in the different modes of puncturing the bladder, are liable
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to considerable changes in their structure ; some of which changes are consistent with health, many the consequence of disease ; but any of them will, in most cases, considerably influence the success of the operation. Therefore, in every case, before the advantages, and disadvantages, of each mode of operating, with respect either to their immediate, or to their remote consequences, can be determined, it is necessary to be acquainted with the exact state of the parts concerned.

III.

A retention of urine arising, sometimes from a change in the structure of the urethra, or of some part connected with it ; sometimes from a diseased action of these parts ; it is necessary to be acquainted with the cause of it, also, before it can be ascertained which mode of operating is preferable.

IV.

IV.

Supposing all the parts concerned in the operations to be in a state of health; when the patient is moderately thin; the operation above the pubes is most easy to perform; and most simple, with respect to the anatomy of the parts. The operation per ano is simple, and by no means difficult. The parts concerned in the operation in perinæo, are more numerous than in either of the above operations; and the precise situation of some of them being rather uncertain, the operation is more complex and difficult.

V.

If the natural passage can be restored immediately, the easiest mode of operating is preferable; as the urine may be evacuated as freely, and the wound will heal as readily, as in that mode of operating which is more difficult.

VI.

VI.

If the natural passage cannot be restored immediately ; or, if the case is doubtful ; the operation per ano ought to be preferred. The patient can, generally, retain his urine ; he is freed from the danger and trouble of a canula ; and, what is of still more consequence, he can expel the urine freely, whenever he pleases, without danger of its collecting in the surrounding parts.

VII.

If any of the parts to be wounded, in either mode of operating, have undergone such a diseased change in their structure as may lessen their powers of restoration, or such a change as may render the precise situation of any important part uncertain, that mode of operating ought, if possible, to be avoided. Therefore, when the prostate gland is enlarged ; and
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in many diseases of the perinæum; it is improper to perform the operation in perinæo. When the rectum is affected with a scirrhus; in some cases of hæmorrhoides; when the prostate gland is so enlarged, that the operation cannot be performed above it; and in any case where the fluctuation of the urine cannot be distinctly felt, by a finger, in the rectum; the operation per ano is improper. When the patient is very corpulent, or is dropfical; or when the bladder cannot be felt distinctly, as the situation of the peritonæum is uncertain, the operation ought not to be performed above the pubes.

APPENDIX.

PRACTICAL OBSERVATIONS ON SOME
OF THE CAUSES OF RETENTION OF
URINE, AND ON THE USE OF CATHE-
TERS.

IN the preceding observations on retention of urine, the principal object I had in view was, the operation of puncturing the bladder. As the performing of this operation is highly improper, before every milder method, from which there is a chance of obtaining relief, has been tried; any ob-

servations in that place, on the introduction of catheters, would have been foreign to the subject. But as the introduction of a catheter, though apparently a very simple, is often an extremely delicate and difficult operation ; and, at the same time, an operation on the facility of performing, and on the proper management and success of which, the life of a patient, sometimes, depends ; I hope I shall not be thought tedious, if I venture, here, to make some observations upon it.

SECTION I.

OF CATHETERS, AS ADAPTED TO THE
URETHRA IN ITS HEALTHY STATE.

A Catheter ought to correspond, in length, diameter, and curvature, with the urethra into which it is introduced. It ought to be of a sufficient length to enter the bladder; of such a diameter as to pass freely, and yet, in some degree, to fill the urethra, that its extremity may not catch in the sides of it, or get into some of the larger lacunæ; and, in curvature, it ought to correspond with the curvature of the urethra. All this, I have no doubt, will, generally speaking, be universally allowed.

As

As the general form of the urethra, the dimensions of those catheters which are in most frequent use, and the mode of introducing them through an healthy urethra, are all laid down in numerous works which are in the hands of every body, it is not necessary for me to take up much time on that part of the subject. But I think it necessary to observe, that the catheters in general use do, most of them, vary, very considerably, from the urethra, in the degree of curvature; and, indeed, they vary very considerably from each other; although they almost all agree in this, that they form a segment of a much larger circle, than that formed by the urethra; and their curvature is lessened towards the point.

As that part of the urethra, on the outer side of the pubes, freely admits of flexion, in any direction; and as the membranous part, where the principal curvature is formed,

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ed, admits of considerable variation from its natural state, little inconvenience is, in general, observed, from this difference. When the catheter is suffered to pass gently along, and to take its own direction, it follows that course where there is least resistance; and, by that means, although it does not press immediately in a proper direction, it generally enters the bladder. But for a catheter to enter the bladder with the greatest ease, the curvature ought to be greater than it commonly is, and ought to be continued equally to the extremity. This renders a little more attention necessary, in passing it as far as the bulb. That, however, is of little consequence; as the catheter we are now speaking of, ought never to be used for the removal of any obstruction in that part of the passage of the urethra, situated between the bulb and the external orifice. But when the point arrives at the curvature

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ture of the urethra, it passes, with much greater ease; is less liable to catch in any irregularities, or in the lacunæ; and there is a much greater chance of its overcoming any resistance that may be in the passage: for, on its entering this part, the centre of the canal becomes the centre of its motion; and, the curve of the catheter following the curve of the urethra, the force propelling it forwards, acts, equally, on all sides of the canal, and not on its posterior side only, as is the case with the generality of catheters. Thus the catheter passes on, scarcely altering the relative situation of the parts. When this circumstance is attended to, the surgeon has a much better command, also, of the instrument, and is able to vary the direction of its point with much greater ease.

Many practitioners direct us to begin passing a catheter, with the concave part
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towards the abdomen; while others direct us to keep the concave part downwards, until the point be passed under the arch of the pubes. More stress is often laid on this part of the operation, than it appears to deserve. It seems, to me, very immaterial which mode is preferred; though, perhaps, the former, being the simplest, is generally the best. If the instrument is passed slowly along, and the handle of it is kept sufficiently elevated, the point passes with the greatest ease under the arch of the pubes, even when it is much more curved than catheters commonly are. In some cases, where the urethra was very irritable, I have seen the patient express considerable pain, during the time of turning the catheter; although it was done with the greatest care, and the point kept as steady as possible.

SECTION II.

OF THE DISEASES CAUSING RÉTENTION
OF URINE, AND OF THE USE OF CATHE-
TERS IN THEM.

BEFORE an instrument is passed into the bladder, to draw off the urine, the cause of its retention should, if possible, be ascertained. Cases of retention of urine often occur, where the immediate introduction of an instrument is improper, or impracticable; and where other means may first be tried, with greater propriety, and a much greater chance of success.

When artificial means are employed to procure an evacuation of the urine, it is
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because the bladder is not capable of overcoming the resistance which the urine meets with, in its passage thro' the urethra. This may arise from different causes.

It may arise from a diminution, or loss, of the contractile power of the bladder; rendering it incapable of overcoming the usual resistance; as is the case in paralysis of the bladder; or when it has contracted firm adhesions with the surrounding parts, in consequence of violent inflammation, as now and then happens. In these instances, no difficulty is found in passing a catheter.

Or it may arise from an increased resistance in the passage of the urethra. This resistance may be produced by a variety of causes: by a substance pressing on the orifice of the urethra, as a calculus, a polypus, hydatids, &c.; or by tumors pressing the sides of the urethra

together. Or it may be caused by a disease of the urethra, or of the prostate gland.

When a retention of urine arises from a calculus, or any substance, falling on the orifice of the urethra, there is, generally, no difficulty in introducing a catheter; sometimes it gives the patient a degree of pain, from the irritable state of the neck of the bladder.

When the resistance to the passage of the urine is caused by a tumor pressing on the sides of the urethra, before an attempt is made to pass a catheter, the surgeon should endeavor to ascertain the nature of the tumor, and its precise situation, with respect to the urethra. The knowledge of this, is often of great consequence in introducing an instrument; and, sometimes, will prevent the necessity of it, by
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enabling him to remove a part of the pressure ; as, for instance, when an abscess forms in perinæo, and, by its pressure, causes a retention, means should be employed to abate the inflammation ; when suppuration has taken place, an opening should be made into it, as early as possible, and the pus evacuated ; when the urine will, frequently, flow spontaneously.

The most frequent, and the most serious cases of retention of urine, arise from diseases of the urethra, and of the prostate gland. It is in these cases, that a catheter, which, in general, is a safe instrument, and is managed with great ease, becomes frequently a formidable and dangerous instrument, requiring the greatest judgment, delicacy, and attention, in the management of it.

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There is a variety of diseases of the urethra, which occasion a retention of urine; but a catheter ought not to be used, indiscriminately, in them all. Very few are the cases in which a surgeon, if he is called in in time, ought not first to employ such other means as the nature of the symptom shall dictate.

Diseases of the urethra may be divided into, such as arise from a diseased action; such as arise from an alteration in the structure; and such as are complicated.

I. *Of* INFLAMMATION.

INFLAMMATION of the urethra, either from venereal or other causes, sometimes becomes so violent, as to produce a total retention of urine; and the attention of the patient is, frequently, so engaged by
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the latter symptom, that he supposes it to be the cause of all his sufferings. On the contrary, it is the effect of the disease. For, when the retention of urine is complete, it is because there is no urine in the bladder; the inflammation having extended up to the kidneys, and prevented the secretion of it. Where there is violent inflammation of the urethra, and neck of the bladder, extreme strangury is often the consequence; the urine coming away, with great pain and difficulty, by drops: but I never heard of inflammation, alone, causing a total retention of urine, if there was any in the bladder.

The introduction of a catheter in these cases is highly improper; it puts the patient to a vast deal of pain, unnecessarily, and infallibly increases the disease it is intended to remedy. On the other hand, bleeding largely, and repeating it with freedom;
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the warm bath ; emollient clysters, given frequently ; fomentations ; antimonials, and opium, by the mouth, in small doses ; and the antiphlogistic plan followed to its greatest extent, is generally found to reduce the inflammation, and produce a speedy flow of the urine.

II. *Of SPASM.*

THE urethra is subject to another diseased action, also ; which is a violent morbid contraction, without inflammation. This is generally called, a spasm of the urethra. Those cases of this disease which I have seen, were in people whose ureters were very irritable ; and this irritability appeared to be brought on, either by a preceding inflammation from gonorrhea, or some other cause, or from the presence of a stricture. A person who has once
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been troubled with it, is very liable to a return ; and, in many people, it seems to become habitual, returning at frequent and uncertain periods. The degree of its violence is uncertain ; and the time of its continuance is equally so. Sometimes it is productive only of a slight pain, and difficulty in voiding the urine, and disappears in a short time. Occasionally, it is more violent and continued ; causing a complete retention of urine. When this is the case, the violent action of the bladder, and abdominal muscles, presses the urine against the diseased part, and thus keeps up a constant irritation, which renders the disease more obstinate.

It is not always, however, that the introduction of an instrument is found necessary to draw off the water, in a spasm of the urethra, unconnected with any diseased alteration in its structure. It should not

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be attempted except, in cases where there is a complete retention, and the bladder is so distended, that we have reason to fear an inflammation, before any other means have time to produce their effect ; and, even then, an attempt should first be made to introduce a bougie.

A spasm of the urethra, complicated with a stricture, I shall speak of presently ; and the treatment, both of simple and complicated spasm, is very similar : so that, as far as relates to the acute symptoms, they may often be looked upon as the same disease, only differing in degree ; especially as the surgeon is frequently at a loss to ascertain whether there be a permanent stricture or not. The manner, therefore, of treating simple spasm, may, with ease, be collected from the observations that will presently occur, respecting the treatment of the complicated disease.

III. *Of*

III. *Of STRICTURE, complicated with the foregoing DISEASES.*

THE urethra, as I before observed, is subject to diseased changes, not only in its actions, but also in its structure.

Diseases arising from this cause, are more tedious, and less acute, than those depending on the former; and are extremely liable to be complicated with them.

The most frequent disease of this kind taking place, primarily, in the urethra, and the only one which I shall mention here, is stricture.

As a stricture is a considerable time in forming, and increases by slow degrees, it never, alone, causes a complete retention of urine; for, before a stricture closes the

passage of the urethra, a new passage is always formed in the parts beyond it. There would, therefore, be no occasion for noticing this disease, in this place, were it not that persons laboring under strictures, are liable to inflammation, to spasm, or to calculi, being retained by them : thus giving rise to some of the most distressing cases of retention of urine ; which, oftentimes, can be relieved by an operation only.

When inflammation comes on a stricture, the plan of treatment proper in a simple inflammation of the part, ought to be pursued, and carried to its utmost extent, before any attempt is made to introduce an instrument.

Urethras laboring under a stricture, seem to be peculiarly liable to a spasm ; and this complicated disease is, as far as my observations have extended, a more frequent

quent cause of obstinate retentions of urine, than any that occurs.

In these cases, it should be recollected, that there are two causes, operating together in the production of the disease: the one, a permanent change in the structure of the part; which can be removed by local applications only: the other, a temporary change in the actions of the part; which, if time will permit us to wait, may, often, be removed, by the application of remedies, both general and local; or which will, frequently, cease spontaneously. It should be recollected, also, that the means which are necessary to remove the stricture, have, often, a manifest tendency to increase the spasm.

As the stricture, alone, did not produce a complete retention of urine, we have reason to think that, if the diseased action
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can first be removed, the urine may be evacuated by its natural passage; and then time will be obtained to employ proper means for the removal of the former disease.

Unless the attendance of a surgeon is neglected so long, that the symptoms from retention become alarming, and there is danger from inflammation and mortification, no attempt ought to be made to pass a catheter into the bladder, until other means have been used to lessen, or, if possible, to remove the spasm: for we shall, almost certainly, be foiled in the attempt; and, if we are, the irritation offered to the parts will render the disease more violent. If an attempt is made, at this time, to introduce a bougie, it should be with a view only of ascertaining the nature of the disease; it ought to be introduced with extreme caution; and, on its meeting with a per-

permanent resistance, it ought to be withdrawn.

The other means that may be used to lessen, or remove the spasm, are such as are known to lessen the spasmodic action of the muscles, in other parts; and such as are known, from experience, to have before produced good effects in this disease. These remedies are either local or general.

When the disease is not very violent, the former, alone, are frequently capable of removing it; as, emollient, and anodyne clysters; fomentations, and poultices; to the perinæum. Stimulating applications, rubbed on the perinæum, have, often, produced a good effect; as volatile liniment, and many of the rubefacientia. I have seen relief obtained by rubbing the perinæum, gently, for some time, with a
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mixture of camphorated spirits, and tincture of opium. Blisters to the perinæum, above the pubes, or to the sacrum, have been recommended. Dipping the glans penis in cold water, is said, sometimes to have removed the spasm. Dashing cold water on the abdomen, has been recommended; and I have seen it tried, but without the least good effect. Electricity has been recommended. In some cases, where the patient has been constive, a purgative has procured a relaxation of the spasm.

But if local remedies do not give relief, in a short time, they should be joined with those that act upon the system in general. Of these, one of the most powerful is, opium, given in large doses, and repeated as often as the system can bear it. Those means which lessen the force of the circulation, and of the muscular action in general,

neral, are very powerful remedies ; and have, frequently, brought on a flow of the urine, after almost every other remedy has failed ; and after attempts, to pass a bougie, or a catheter, have been made in vain. The means, for this purpose, are various. Bleeding from a large orifice, till the patient begins to faint, will sometimes cause a relaxation of the spasm, and the urine will come away on pressing the lower part of the abdomen ; or a bougie will be found to pass, although it was resisted a few minutes before. When this method has failed, I have seen a strong infusion of tobacco, given, a few drops every half hour, till it excites nausea, prove effectual. It lessens the force, and frequency, of the pulse, and induces an universal debility over the whole system, sometimes to an amazing degree. Under this state I have seen the spasm abate, and the urine come away merely upon pressing the abdomen. But

great attention is necessary in the use of this remedy ; for it is very powerful in its operation, and, at the same time, very variable in its strength : also it operates more readily upon some persons, than upon others ; and, if given in too large doses, is liable to induce very alarming symptoms. The nausea, and affection of the head, sometimes, becomes excessively distressing ; the pulse weak, and slow ; the countenance pallid ; the body covered with cold sweats ; and the patient perpetually fainting : therefore, when it is necessary to have recourse to this remedy, it ought to be given in very small doses, increased in the most gradual manner, and not repeated oftener than the time above-mentioned,

About five years since, I had a patient laboring under this disease ; on whom all the common methods of treatment were tried, without success. I wished to try the
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infusion of tobacco ; but having, not long before, seen an instance in which the above symptoms were brought on by its use, and became alarming ; I was willing, in the first place, to try the effects of another remedy. At that time, I was attending Mr. Cline's lectures on anatomy, and recollected that he had mentioned a case, where the *tinctura ferri muriati* was given, with good effect. The particulars of that case, I do not, at this time, exactly recollect ; but it induced me, to recommend the remedy. The patient was ordered to take ten drops, for the first dose ; and afterwards six drops, every fifteen minutes. After the third, or fourth dose, a degree of nausea came on ; the pulse became slower, and a general relaxation, and temporary debility, took place. During this time, I attempted to pass a bougie ; and succeeded, with tolerable ease. It was suffered to remain in the bladder, till an effort was made to expel

the urine ; when, being withdrawn, the urine followed it pretty freely. I have not had sufficient experience of this medicine, to say that it will prove generally successful ; but it appears to me a valuable remedy. It is more manageable than the infusion of tobacco ; and the symptoms it produces, are less distressing : therefore, I think it very worthy of trial, when the symptoms are not so urgent, as to render the delay, attending its exhibition, dangerous.

These means, if they do not produce the effect desired, will, at least, be of service in rendering the urethra less irritable ; and, consequently, will increase the chance of success, in the introduction of an instrument.

When it is found necessary to introduce an instrument, a bougie ought to be tried first ; it is much safer than a catheter ; will
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irritate the parts less ; and, oftentimes, can be introduced when a catheter cannot. *

If a bougie cannot be passed by the usual means, attempts may be made to pass it, while the patient is in the warm bath. I have been able to pass it, during a fainting fit. This, sometimes, comes on spontaneously ; or from the action of the medicines the patient has been taking ; or it may be brought on, by taking away a sufficient quantity of blood from a large orifice.

If the surgeon has time to pursue the means above laid down, with proper attention, he will succeed in evacuating the urine, in most cases of simple spasm ; and, generally, in cases also where it is complicated

* Most of the circumstances requiring attention, in the use of bougies, being laid down by various authors ; particularly by Mr. HUNTER, in his treatise on the venereal

plicated with stricture. Sometimes, however, notwithstanding all his attention, he will fail of succeeding: but more frequently it will happen, that his attendance is not desired till the retention of urine produces alarming symptoms, and the patient's life is in danger; or, at least, till the disease is so far advanced, that there is not sufficient time to pursue, with safety, all the means above laid down. Sometimes, also, to add to his difficulties, a violent inflammation is added to the original disease; or the urethra is lacerated, by the improper use of a catheter.

Catheters are, in general, too much used in these diseases: it is a common practice with many practitioners, the moment they
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venereal disease; and by Mr. BELL, in his treatise on gonorrhœa and lues venerea; it is thought unnecessary to take up any time on that subject.

hear of a retention of urine, to think of introducing this instrument. But let those practitioners recollect, that a catheter, in the disease we are now speaking of, unless used with great ability, is a very formidable instrument; that it requires the greatest dexterity, and the most extreme caution, not only to use it to advantage, but to use it without doing irreparable mischief. I have, frequently, seen instances, where much mischief has been done, by its use; and have heard of many more. At the same time, it must be observed, that in the hands of a skilful operator, there are few cases in which it is not a safe instrument; and many in which it may be used to great advantage, after bougies have failed of success. This is more especially the case, when the disease is situated in the membranous part of the urethra, and is a simple spasm, or a spasm complicated with a slight stricture; for, in these cases, a bougie, in

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consequence of its bending or softening, is less manageable than a catheter is.

We will now suppose that all the means above-mentioned, and all that art can prescribe, have been tried ; as far as time will permit, for the removal of the spasm, but in vain ; and that a catheter is had recourse to, as the last resort before an artificial passage is made for the urine.

By this I do not mean to insinuate, that a catheter should, in no case, be tried, till this state of the disease. In the hands of a skilful surgeon, as I have just observed, there are few cases where its introduction may not be attempted, with safety. To him a greater latitude is allowable. His judgement will direct him, in what cases it may be used with a probable chance of success, and how far it may be persisted in, consistently with the advantage of the patient ;

ent ; it will point out the degree of force that may be used with safety, and the direction in which that force should be applied ; and, in case he is foiled, when, and how long, he may desist from its use, and continue the application of other means. But where the surgeon is little accustomed to the use of this instrument, and is in any doubt respecting the precise nature of the case, I have little hesitation in saying, that it ought not to be meddled with till the period I am now supposing. At what period soever a catheter may be used, many of the observations I shall make are generally speaking, equally applicable ; only, the less urgent the symptoms are, the more cautious, if possible, should we be in the use of it.

When the disease is a simple spasm, a catheter of a moderate diameter, is generally found to answer better, than one of

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a very small diameter ; but when the spasm is complicated with a stricture, the diameter of the catheter should be small enough to pass the stricture, if possible, without doing it violence. For the immediate objects are, to draw off the urine, and remove the spasm, leaving the stricture to be removed by proper treatment at a future period ; but the least violence done to the part, tends to increase the spasm.

If the disease is seated in that part of the urethra which is between the glans and the bulb, it is seldom necessary to pass a catheter into the bladder ; therefore, one that is nearly strait, is the best. Or, if a strait catheter, that is of a sufficient length, cannot be obtained, such a common one, as is least curved, towards the point, should be substituted. But if the disease is in the membranous part, the curvature of the catheter ought to equal, if possible, the
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curvature of the urethra : for as the catheter must pass through the urethra, by forcing the sides of it asunder, it ought to pass exactly along the course of it, and press, equally, in every direction ; but these advantages can be obtained, with any degree of certainty, in no other manner, than by making the curvature of the former to correspond exactly with that of the latter. If this is not attended to, the point of the instrument, when it comes to the diseased part, instead of pressing against its centre, presses principally against its posterior part. In common catheters, this defect may be remedied, in some measure, though by no means completely, by depressing the handle ; which throws the point of the instrument forwards. But, still, the point does not describe the course of the urethra ; and, without extreme attention, there is great danger of forcing it through its sides.

A catheter should be introduced with the greatest caution; should be pressed forwards, slowly, and gradually, with very moderate force; and should be permitted, in some measure, to take its own direction, particular care being taken that its point does not get into any of the lacunæ. The surgeon cannot, occasionally, leave a catheter, with its point, in the urethra, as he may a bougie; for if the hand is removed, the instrument immediately slips from its place. Therefore, he must keep the extremity of the instrument in his hand; and, when the point arrives at the diseased part, he must endeavor to get it on by very slow degrees, and increase the force in a very gradual manner, continuing it for a considerable time. To this means, the spasm will sometimes gradually yield; and the catheter will pass. Great attention should be paid, to increase the force in the most gradual manner, and, at
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the same time, not to apply it, in such a degree, as to endanger the forcing of it through the sides of the urethra.

After having persevered in this plan, for a sufficient time to give it a fair chance, if we do not succeed, it is better, in my opinion, to puncture the bladder at once, than, by persisting in an attempt, which, most probably will prove fruitless, uselessly inflame, and tear the urethra; render the disease more violent; and, perhaps, destroy the patient.

Frequently, the stricture has so lessened the diameter of the canal, that a catheter of the smallest diameter would not pass, before the spasm came on. This, though it cannot always be known to a certainty, sometimes may; and may generally be suspected, by the degree of difficulty the patient has experienced in expelling his urine, and by the smallness of the stream.

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In these cases, it is in vain to think of passing a catheter, without forcing it through the stricture; and this would be a very dangerous practice, it being uncertain what course the catheter might take.

Therefore, when the case is clear, if a bougie fails, it is better not to attempt the introduction of a catheter, but to puncture the bladder.

IV. *Of an* ENLARGEMENT *of the* PROSTRATE GLAND.

THE last disease I shall mention, as causing a retention of urine, and rendering the use of a catheter necessary, is an enlargement of the prostate gland.

But, as I have spoken of this disease in the preceeding pages, I shall confine myself, now, to the use of the catheter in it.

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I have already observed, that, in this disease, that portion of the urethra which is situated within the prostate gland, becomes much longer, more curved, and at the time wider, than it is in its natural state. I have observed, also, that when a retention of urine takes place in this disease, it is in consequence of the sides of the prostate gland being pressed firmly together, and the posterior part projecting forward; thus acting as a valve to the urethra. It is necessary, therefore, that the catheter, which is used in these cases, be one inch and an half, or two inches, longer than in other cases: at the same time, its curvature ought to be increased in proportion to the increased curvature of the urethra; especially towards the point. Where we are foiled in passing a catheter; it is stopped, by the posterior portion of the prostate projecting forwards so much, that the point of a
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common catheter cannot be slipped before it, but is detained in one of the depressions, on the sides of the caput galinaginis ; or, entangled in some of the larger lacunæ ; or in the excretory ducts of the vesiculæ feminales, which are generally much enlarged ; or, if the instrument is pushed forwards too forcibly, the point is buried in the substance of the prostate gland.

A catheter, of a proper length, and curvature, and of such a diameter, as to pass with ease through the sound part of the urethra, being provided, and introduced as far as the diseased part, an attempt should then be made to slip it before the projecting portion of the diseased prostate, by depressing the handle, and pushing it gently forward. If this does not succeed, a finger should be passed into the rectum. By means of this, we shall have a more perfect command of the point of
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the instrument; which, as the passage is pretty wide, may be moved about, with tolerable ease. Endeavors may then be made to pass it forwards, by moving it about in various directions; for, sometimes, the enlargement is confined principally to one side of the gland, and then the urethra is forced to the opposite side. But this should constantly be kept in remembrance; that no force ought to be used; unless the surgeon has previously determined, to thrust the catheter through the substance of the prostrate gland: it cannot possibly do any good; on the contrary, there is a certainty of its doing mischief, by lacerating, and inflaming the parts. The urethra is not impervious; nor is it too narrow for the instrument to pass; for it is wider than natural. The reason why the urine cannot pass out of the bladder is, as I before observed, that the sides of the gland, and the posterior part of it, which

are much enlarged, fall together, and acting as valves, prevent it. And the reason why the catheter does not pass into it, is, that the passage is become more curved; and the instrument, instead of following the direction of the passage, presses against the projecting part of the prostate gland. But if the point of the catheter is directed along the course of the urethra, it passes, in most cases, with tolerable ease; the great difficulty, then, consists in finding the course of the urethra: to remove this difficulty, the observations above laid down must be attended to; and, when the surgeon is acquainted with the nature of the disease, and the general alteration, which has taken place in the structure of the parts, every thing depends, in a great measure, upon his facility in handling the instrument; no two cases being exactly similar. The chance of success is greater, in proportion, as he handles it with more dexterity.

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The catheter in the hands of a surgeon, like the pencil in the hand of a painter, requires frequent use, and much practice, to be managed with facility and success. Rules may be laid down for the forming of a rough outline ; but those more delicate movements which, in many instances, are necessary to ensure success, can no more be described, than a painter can describe those finer touches of his pencil, which are necessary in the perfecting of some finished performance.

FINIS.

It is proposed to publish, in a short time, some practical observations on the treatment of COMPOUND FRACTURES, containing an answer to the following question ; proposed by the LYCEUM MEDICUM LONDINENSE, as the subject of their prize dissertation, for the year 1792.

“ What are the best methods of treating compound fractures, according to the degree of injury the limb has sustained ? ”
